



BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XC779

Takes of Marine Mammals Incidental to Specified Activities; Low-Energy Marine Geophysical Survey in the Dumont d'Urville Sea off the Coast of East Antarctica, January to March 2014

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an Incidental Take Authorization (ITA).

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) regulations, notification is hereby given that NMFS has issued an Incidental Harassment Authorization (IHA) to the National Science Foundation (NSF), Division of Polar Programs, and Antarctic Support Contract (ASC) on behalf of five research institutions: Colgate University, Columbia University, Texas A&M Research Foundation, University of South Florida, and University of Texas at Austin, to take marine mammals, by Level B harassment only, incidental to conducting a low-energy marine geophysical (seismic) survey in the Dumont d'Urville Sea off the coast of East Antarctica, January to March 2014.

DATES: Effective January 31 through April 27, 2014.

ADDRESSES: A copy of the final IHA and application are available by writing to Jolie Harrison, Supervisor, Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910, by telephoning the contacts listed here, or by visiting the internet at:

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications>.

NSF and ASC have provided an “Initial Environmental Evaluation/Environmental Assessment to Conduct Marine-Based Studies of the Totten Glacier System and Marine Record of Cryosphere – Ocean Dynamics” (IEE/EA), prepared by AECOM, on behalf of NSF and ASC, which is also available at the same Internet address. NMFS also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the survey and IHA on marine species listed as threatened and endangered. The NMFS Biological Opinion is available online at: <http://www.nmfs.noaa.gov/pr/consultations/opinions.htm>. Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Howard Goldstein or Jolie Harrison, Office of Protected Resources, NMFS, 301-427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the MMPA, as amended (16 U.S.C. 1371 (a)(5)(D)), directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for the incidental taking of small numbers of marine mammals shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of

taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such takings. NMFS has defined "negligible impact" in 50 CFR 216.103 as "...an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On July 3, 2013, NMFS received an application from the NSF and ASC requesting that NMFS issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals incidental to conducting a low-energy marine seismic survey in International Waters (i.e., high seas) and in the Southern Ocean off the coast of East Antarctica during January to March 2014. Per NMFS request, NMFS received an addendum to the application from the NSF and ASC on December 18, 2013, which reflected updates to incidental take requests for marine mammals related to icebreaking activities.

The research will be conducted by five research institutions: Colgate University, Columbia University, Texas A&M Research Foundation, University of South Florida, and University of Texas at Austin. The NSF and ASC plan to use one source vessel, the RVIB Nathaniel B. Palmer (Palmer), and a seismic airgun array to collect seismic data in the Southern

Ocean. The vessel will be operated by Edison Chouest Offshore, Inc., a subcontractor to ASC, which operates the United States Antarctic Program under contract to the NSF. In support of the United States Antarctic Program, the NSF and ASC plan to use conventional low-energy, seismic methodology to perform marine-based studies in the Dumont d'Urville Sea to include evaluation of geophysical and physical oceanographic features in two areas along the coast of East Antarctica (see Figures 1, 2, and 3 of the IHA application). The primary area proposed for the study is the Totten Glacier system (preferred study area) including the Moscow University Ice Shelf along the Sabrina Coast, and a secondary area, the Mertz Glacier and Cook Ice Shelf, along the Oates Coast. In addition to the planned operations of the seismic airgun array and hydrophone streamer, NSF and ASC intend to operate a single-beam echosounder, multi-beam echosounder, acoustic Doppler current profiler (ADCP), and sub-bottom profiler continuously throughout the survey. On January 3, 2014, NMFS published a notice in the Federal Register (79 FR 464) making preliminary determinations and proposing to issue an IHA. The notice initiated a 30-day public comment period. On January 7, 2014, NMFS published a notice in the Federal Register (79 FR 816) correcting the close of the public comment period from February 3, 2014 to January 30, 2014.

Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array and from icebreaking activities have the potential to cause marine mammal behavioral disturbance in the survey area. This is the principal means of marine mammal taking associated with these activities, and NSF and ASC have requested an authorization to take 14 species of marine mammals by Level B harassment. Take is not expected to result from the use of the single-beam echosounder, multi-beam echosounder, ADCP, acoustic locator, and sub-bottom profiler, as the brief exposure of marine mammals to one pulse, or small numbers of

signals, in this particular case is not likely to result in the harassment of marine mammals. Also, NMFS does not expect take to result from collision with the source vessel because it is a single vessel moving at a relatively slow, constant cruise speed of 5 knots [kts]; 9.3 kilometers per hour [km/hr]; 5.8 miles per hour [mph]) during seismic acquisition within the survey, for a relatively short period of time (approximately 45 operational days). It is likely that any marine mammal will be able to avoid the vessel.

Description of the Specified Activity

NSF and ASC plan to conduct a low-energy seismic survey in the Dumont d'Urville Sea in the Southern Ocean off the coast of East Antarctica from January to March 2014. In addition to the low-energy seismic survey, scientific activities will include conducting a bathymetric profile survey of the seafloor using transducer based instruments such as a multi-beam echosounder and sub-bottom profiler; conducting magnetometry and imaging surveys using an underwater camera assembly; collecting sediment cores and dredge sampling; and collecting water samples and conductivity (salinity), temperature, depth (CTD) and current data through the deployment and recovery of short-term (in place for approximately one month) and long-term (in place for approximately one year) instrumentation moorings, CTD equipment casts, and the use of transducer-based ADCP instruments. Sea ice conditions will dictate areas where the ship and airguns can operate. Due to dynamic ice conditions, which cannot be predicted on a local scale, it is not possible to develop tracklines a priori. The seismic survey will be conducted in one or both of the two study areas depending on the sea ice conditions; however, the preferred study area is the Totten Glacier region (see Figure 2 of the IHA application). Water depths in the survey area range from 100 to 1,000 meters (m) (328.1 to 3,280.1 feet [ft]), and possibly exceeding 1,000 m in some areas. The seismic surveys are scheduled to occur for a total of less

than or equal to 300 hours at one or both of the two study areas for approximately 45 operational days in January to March 2014. The operational hours and survey length will include equipment testing, ramp-up, line changes, and repeat coverage. The long transit time between port and the study site constrains how long the ship can be in the study area and effectively limits the maximum amount of time the airguns can operate. Some minor deviation from these dates will be possible, depending on logistics and weather.

The planned survey of Totten Glacier and Moscow University Ice Shelf along the Sabrina Coast continental shelf is designed to address several critical questions. The Totten Glacier system, which drains one-eighth of the East Antarctic Ice Sheet and contains more ice volume than the entire West Antarctic Ice Sheet, remains the single largest and least understood glacial system which possesses a potentially unsteady dynamic. If it were to melt, the sea-level will rise by more than 5 m (16.4 ft) worldwide. The planned marine studies will help to understand both the dynamics and the controls of the Totten Glacier system, and to resolve ambiguity in large ice mass dynamic behavior. This research will be accomplished via the collection of glaciological, geological, and physical oceanographic data. In order to place the modern system, as well as more recent changes to the system, into a longer-term perspective, researchers will collect and interpret marine geologic, geochemical, and geophysical records of the longer term behavior and response of this system.

The planned research will complement fieldwork studying other Antarctic ice shelves oceanographic studies near the Antarctic Peninsula, and ongoing development of ice sheet and other ocean models. It will facilitate learning at sea and ashore by students, help to fill important spatial and temporal gaps in a sparsely sampled region of coastal Antarctica, and communicate its findings via publications and outreach. Obtaining records of currents and oceanographic

properties in this region are consistent with the objectives of the Southern Ocean Observing System for climate change. The work will enhance general understanding of air-sea-ice interactions, ocean circulation, ice shelf sensitivity to climate change, and the present and future roles of East Antarctic Ice Sheet on sea level. The Principal Investigators are Dr. Amy Leventer of Colgate University, Dr. Donald Blankenship and Dr. Sean Gulick of the University of Texas at Austin, Dr. Eugene Domack of the University of South Florida, Mr. Bruce Huber of Columbia University, and Dr. Alejandro Orsi of Texas A&M Research Foundation.

The procedures to be used for the surveys will be similar to those used during previous low-energy seismic surveys by NSF and will use conventional seismic methodology. The planned survey will involve one source vessel, the RVIB Nathaniel B. Palmer (Palmer). NSF and ASC will deploy two (each with a discharge volume of 45 cubic inch [in^3] with a total volume of 90 in^3 or each with a discharge volume of 105 in^3 with a total volume of 210 in^3) Sercel Generator Injector (GI) airgun array as an energy source at a tow depth of up to 3 m (9.8 ft) below the surface (more information on the airguns can be found in Appendix B of the IHA application). The receiving system will consist of one 100 m (328.1 ft) long, 24-channel, solid-state hydrophone streamer towed behind the vessel. As the GI airguns are towed along the survey lines, the hydrophone streamer will receive the returning acoustic signals and transfer the data to the onboard processing system. All planned seismic data acquisition activities will be conducted by technicians provided by NSF and ASC with onboard assistance by the scientists who have planned the study. The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

The planned seismic survey (e.g., equipment testing, start-up, line changes, repeat coverage of any areas, and equipment recovery) will consist of approximately 2,800 kilometer

(km) (1,511.9 nautical miles [nmi]) of transect lines (including turns) in the survey area in the Dumont d’Urville Sea of the Southern Ocean (see Figures 1, 2, and 3 of the IHA application). In addition to the operation of the airgun array, a single-beam and multi-beam echosounder, ADCP, and a sub-bottom profiler will also likely be operated from the Palmer continuously throughout the cruise between the first and last survey sites. There will be additional seismic operations associated with equipment testing, ramp-up, and possible line changes or repeat coverage of any areas where initial data quality is sub-standard. In NSF and ASC’s estimated take calculations, 25% has been added for those additional operations.

Table 1. Planned low-energy seismic survey activities in the Dumont d’Urville Sea off the coast of East Antarctica.

Survey Length (km)	Cumulative Duration (hr) ¹	Airgun Array Total Volume	Time Between Airgun Shots (Distance)	Streamer Length (m)
2,800 (1,511.9 nmi)	≤300	2 x 45 in ³ (2 x 737 cm ³) or 2 x 105 in ³ (2 x 1,720 cm ³)	5 seconds (12.5 m or 41 ft)	100 (328.1 ft)

¹ Airgun operations are planned for no more than 16 continuous hours at a time.

Seismic Airguns

The Palmer will deploy an airgun array, consisting of two 45 in³ or two 105 in³ GI airguns as the primary energy source and a 100 m streamer containing hydrophones. The airgun array will have a supply firing pressure of 2,000 pounds per square inch (psi) and 2,200 psi when at high pressure stand-by (i.e., shut-down). The regulator is adjusted to ensure that the maximum pressure to the GI airguns is 2,000 psi, but there are times when the GI airguns may be operated at pressures as low as 1,750 to 1,800 psi. Seismic pulses for the GI airguns will be emitted at intervals of approximately 5 seconds. At a ship speed of approximately 9.3 km/hr, the shot intervals correspond to spacing of approximately will be 12.5 m (41 ft) during the study. There will be approximately 720 shots per hour. During firing, a brief (approximately 0.03 second)

pulse sound is emitted; the airguns will be silent during the intervening periods. The dominant frequency components range from two to 188 Hertz (Hz).

The GI airguns will be used in harmonic mode, that is, the volume of the injector chamber (I) of each GI airgun is equal to that of its generator chamber (G): 45 in³ and 105 in³ for each airgun array. Each airgun will be initially configured to a displacement volume of 45 in³ for the generator and injector. The generator chamber of each GI airgun in the primary source, the one responsible for introducing the sound pulse into the ocean, is 45 in³. The injector chamber injects air into the previously-generated bubble to maintain its shape, and does not introduce more sound into the water. The airguns will fire the compressed air volume in unison in a harmonic mode. In harmonic mode, the injector volume is designed to destructively interfere with the reverberations of the generator (source component). Firing the airguns in harmonic mode maximizes resolution in the data and minimizes any excess noise in the water column or data caused by the reverberations (or bubble pulses). The two GI airguns will be spaced approximately 3 or 6 m (9.8 or 19.7 ft) apart, side-by-side, between 15 and 40 m (49.2 and 131.2 ft) behind the Palmer, at a depth of up to 3 m during the surveys. If needed to improve penetration of the strata, the two airguns may be reconfigured to a displacement volume of 105 in³ each and will still be considered a low-energy acoustic source as defined in the NSF/USGS PEIS. Therefore, there are three possible two airgun array configurations: two 45/45 in³ airguns separated by 3 m, two 45/45 in³ airguns separated by 6 m, and two 105/105 in³ airguns separated by 3 m. The two 45/45 in³ airguns separated by 3 m layout is preferred, the two 45/45 in³ separated by 6 m layout will be used in the event the middle of the three 45/45 in³ airgun fails, and the two 105/105 in³ airguns separated by 3 m will be used only if additional penetration is needed. To summarize, two strings of GI airguns will be available: (1) Three 45/45 in³ airguns

on a single string where one of these is used as a “hot spare” in the event of failure of one of the other two airguns, these three GI airguns are separated by 3 m; and (2) two 105/105 in³ airguns on a second string without a “hot spare.” The total effective volume will be 90 or 210 in³. The two strings will be spaced 14 m (45.9 ft) apart, on either side of the midline of the vessel, however, only one string at a time will be used.

The Nucleus modeling software used at Lamont-Doherty Earth Observatory of Columbia University (L-DEO) does not include GI airguns as part of its airgun library, however signatures and mitigation models have been obtained for two 45 in³ G airguns at 2 m tow depth and two 105 in³ G airguns at 3 m tow depth that are close approximations. For the two 45 in³ airgun array, the source output (downward) is 230.6 dB re: 1 μPam for 0-to-peak and 235.9 dB re: 1 μPam for peak-to-peak. For the two 105 in³ airgun array, the source output (downward) is 234.4 dB re: 1 μPam 0-to-peak and 239.8 dB re: 1 μPam for peak-to-peak. These numbers were determined using the aforementioned G-airgun approximation to the GI airgun and using signatures filtered with DFS V out-256 Hz 72 dB/octave. The dominant frequency range will be 20 to 160 Hz for a pair of GI airguns towed at 3 m depth and 35 to 230 Hz for a pair of GI airguns towed at 2 m depth.

During the low-energy seismic survey, the vessel will attempt to maintain a constant cruise speed of approximately 5 knots. The airguns will operate continuously for no more than 16 hours at a time and duration of continuous operation is dependent on ice concentration. The cumulative duration of the airgun operations will not exceed 300 hrs. The relatively short, 24-channel hydrophone streamer will provide operational flexibility to allow the seismic survey to proceed along the designated cruise track with minimal interruption due to variable sea ice conditions. The design of the seismic equipment is to achieve high-resolution images of the

glacial marine sequence stratigraphy with the ability to correlate to the ultra-high frequency sub-bottom profiling data and provide cross-sectional views to pair with the seafloor bathymetry.

The cruise path will be designated once in the study area and will take care to avoid heavy ice conditions such as icebergs or dense areas of pack ice that could potentially damage the airguns or streamer and minimize proximity to potential marine receptors.

Weather conditions that could affect the movement of sea ice and hinder the hydrophone streamer will be closely monitored, as well as conditions that could limit visibility. If situations are encountered which pose a risk to the equipment, impede data collection, or require the vessel to stop forward progress, the seismic survey equipment will be shut-down and retrieved until conditions improve. In general, the hydrophone streamer and sources could be retrieved in less than 30 minutes.

Bathymetric Survey

Along with the low-energy airgun operations, other additional geophysical measurements will be made using swath bathymetry, backscatter sonar imagery, high-resolution sub-bottom profiling (“CHIRP”), imaging, and magnetometer instruments. In addition, several other transducer-based instruments onboard the vessel will be operated continuously during the cruise for operational and navigational purposes. Operating characteristics for the instruments to be used are described below.

Single-Beam Echosounder (Knudsen 3260) – The hull-mounted CHIRP sonar will be operated continuously during all phases of the cruise. This instrument is operated at 12 kHz for bottom-tracking purposes or at 3.5 kHz in the sub-bottom profiling mode. The sonar emits energy in a 30° beam from the bottom of the ship.

Single-Beam Echosounder (Bathy 2000) – The hull-mounted sonar characteristics of the

Bathy 2000 are similar to the Knudsen 3260. Only one hull-mounted echosounder can be operated a time, and this source will be operated instead of the Knudsen 3260 only if needed (i.e., only one will be in continuous operation during the cruise).

Multi-Beam Sonar (Simrad EM120) – The hull-mounted multi-beam sonar will be operated continuously during the cruise. This instrument operates at a frequency of 12 kHz, has an estimated maximum source energy level of 242 dB re 1 μ Pa (rms), and emits a very narrow (<2°) beam fore to aft and 150° in cross-track. The multi-beam system emits a series of nine consecutive 15 ms pulses.

Acoustic Doppler Current Profiler (ADCP Teledyne RDI VM-150) – The hull-mounted ADCP will be operated continuously throughout the cruise. The ADCP operates at a frequency of 150 kHz with an estimated acoustic output level at the source of 223.6 dB re 1 μ Pa (rms). Sound energy from the ADCP is emitted as a 30° conically-shaped beam. This ADCP is also considered the sub-bottom profiler.

Acoustic Doppler Current Profiler (ADCP Ocean Surveyor OS-38) – The characteristics of this backup hull-mounted ADCP unit are similar to the Teledyne VM-150 and will be continuously operated.

Acoustic Locator (Pinger) – An acoustic locator (i.e., pinger) will be deployed when using the Smith-McIntyre grab sampler and multi-corer (Mega-corer) to enable these devices to be located in the event they become detached from their lines. A pinger typically operates at a frequency of 12 kHz, generates a 5 ms pulse per second, and has an acoustical output of 162 dB re 1 μ Pa (rms). A maximum total of 30 samples will be obtained using these devices and require approximately one hour per sample; therefore, the pinger will operate for a total of 30 hours.

Passive Instruments – During the seismic survey in the Dumont d’Urville Sea, a precession

magnetometer and Air-Sea gravity meter will be deployed. In addition, numerous (approximately 24) expendable bathythermograph (XBTs) probes will also be released (and none will be recovered) over the course of the cruise to obtain temperature data necessary to calculate sound velocity profiles used by the multi-beam sonar.

Core and Dredge Sampling

The primary sampling goals involve the acquisition of marine sediment cores of various lengths up to 25 m (82 ft). It is anticipated that up to 65 sediment cores and grab samples and 12 rock dredge samples will be collected as summarized in Table 3 (Table 3 of the IHA application). Each core or grab sample will require approximately one hour per sample. All cores and dredges will be deployed using a steel cable/winch system.

Approximately 75 m² (807.3 ft²) of seafloor will be disturbed by each of four deployments of the dredge at three different sites (resulting in a total of 900 m² [9,687.5 ft²] of affected seafloor for the project). The selection of the bottom sampling locations and sampling method will be based on observations of the seafloor, subsurface reflectivity, sediment type, and accessibility due to ice and weather conditions. Bottom sampling in the Mertz Glacier area will be limited to strategically selected locations including possible re-sampling at a previous core site.

Table 2. Coring and dredging activities in the Dumont d'Urville Sea.

Sampling Device	Number of Deployments
Smith-MycIntyre grab sampler	10 to 15
Multi-corer (Mega-corer)	10 to 15
Kasten corer (regular or jumbo)	20 to 25
Jumbo piston corer	8 to 10

Box cage dredge	10 to 12
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Limited sampling of rock material will be conducted using a dredge that will be towed along the seafloor for short distances (approximately 50 m [164 ft]) to collect samples of bedrock and ice rafted debris. The available dredges, which have openings of 0.5 to 1.5 m (1.6 to 4.9 ft), will be deployed on rocky substrates. The locations of the planned dredge sites are limited to the inner shelf (southern) perimeter of three areas: the Mertz Trough and two regions along the Sabrina Coast. Final selection of dredge sites will include review to ensure that the seamounts or corals in the area are avoided (AOA, 2011).

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has adopted conservation measures (i.e., 22-06, 22-07, and 22-09) to protect vulnerable marine ecosystems (VME), which include seamounts, hydrothermal vents, cold water corals, and sponge fields. The conservation measure 22-07 includes mitigation and reporting requirements if VME are encountered. The science team will follow these requirements (see Attachment C of the IHA application) if VME's are encountered while sampling the sea bottom.

In addition, a camera and towed video system will be deployed at up to 25 sites. This device will lightly touch the seafloor to establish a baseline and rise to an optimum elevation to obtain the desired images.

Water Sampling and Current Measurements

High-resolution conductivity, depth, and temperature (CTD) measurements will be collected to characterize the summer regional water mass stratification and circulation, and the meridional exchange of waters between the oceanic and shelf regimes. These physical measurements will involve approximately SeaBird CTD system casts including the use of a

lowered ADCP (LADCP).

The LADCP will consist of two Teledyne RDI Workhorse Monitor ADCPs mounted on the CTD/rosette frame and one oriented upward and the other downward. The LADCP and frame will be raised and lowered by cable and winch. The LADCPs will operate at a frequency of 307.2 kHz, with an estimated output acoustic pressure along each 4 beams of 216.3 dB re 1 μ Pa at 1 m. The beams are angled at 20 degrees from the centerline of the ADCP head, with a beam angle of 4 degrees for the individual beams. Typical pulse duration is 5.7 ms, with a typical repetition rate of 1.75 s. The upward and downward-looking ADCPs are operated in master-slave mode so that only one head pings at a time. The LADCP will be operated approximately one hour at every CTD/rosette station (maximum of 100 stations) for a total of 100 hours of operation.

These instruments will be used to profile the full water column for temperature, salinity (conductivity), dissolved oxygen and currents at a series of transects in the study area. Discrete water samples will be collected for salinity and dissolved oxygen to monitor CTD/rosette performance, and for oxygen isotopes to assess meltwater content. Water samples will also be collected for development and interpretation of marine sediment proxies using Niskin bottles.

Observations of the thermal structure along other portions of the cruise track will be made using an underway CTD system and XBTs while the seafloor is swath-mapped. The number and spacing of stations will be adjusted according to ocean features discovered through multi-beam swath mapping and the sea ice conditions. If portions of the study area are inaccessible to the NBP, a contingency sampling focused on the inflows of MDCW will be pursued in adjacent shelf troughs.

It is noted that underway ADCP on the Palmer can, under ideal conditions, obtain profiles

of ocean currents to depths greater than 800 m (2,624.7 ft). On continental shelves where depths may be less than the range of the ADCP, the underway profiles cannot resolve the deepest 15% of the water column due to side lobe reflections from the bottom which contaminate the water column Doppler returns. For a depth of 800 m, expected in the MCDW, currents in the lower 120 m (393.7 ft) could not be measured by the ship ADCP; therefore, the lowered ADCP can provide accurate current profiles to within a few meters of the bottom and provide complete coverage of the velocity field at each CTD station.

Instrumentation Moorings

Four instrumented moorings will be deployed during the cruise to measure current, temperature, and salinity (conductivity) continuously. Two of the moorings will be deployed for approximately one month (short-term moorings) and two moorings will be deployed for approximately one year (long-term moorings). The two short-term moorings and one long-term mooring will include ADCP paired with CTD recorders, and additional intermediate T (i.e., temperature) recorders. The characteristics of the ADCP units deployed on the moorings are similar to the Teledyne VM-150; the moored ADCPs operate at frequencies of 75 kHz (one unit) and 300 kHz (two units). The fourth mooring will be equipped with sediment traps, a CTD recorder and intermediate T recorders, and be deployed for approximately one year (long-term mooring). The two long-term moorings will be retrieved approximately one year later by a U.S. Arctic Program (USAP) vessel or collaborators from other countries.

Subject to sea ice conditions, these moorings will preferably be placed in front of Totten Glacier, but otherwise as close as possible inside adjacent cross-shelf troughs. If access to the inner shelf is not allowed by sea ice conditions, mooring deployments will be attempted within the outer shelf close to the troughs mouth, where the Totten Glacier is more directly connected to

inflows from the oceanic domain offshore. The two long-term moorings will be deployed within 16 km of each other. The short-term moorings will be within a few kilometers of each other and no farther than 32 km (17.3 nmi) from the long-term moorings. All instruments will be kept at depths below 250 m (820.2 ft) to minimize damage or loss by icebergs.

The moorings will be temporarily attached to anchors and be recovered using acoustic release mechanisms. The mooring recovery process will be similar regardless of mooring type or when they will be retrieved. Locating the moorings and releasing the moorings from the steel railroad wheel anchors (which will not be recovered) will be accomplished by transmitting sound over a period of several seconds. This is done with an acoustic deck command unit that sends a sequence of coded pulses to the receiving units, the acoustic releases, connected to the mooring anchors. The acoustic releases response to acknowledge the receipt of commands from the deck unit is by transmitting a short sequence of pulses back. Both of the acoustic units (onboard deck unit and moored releases) operate at frequencies between approximately 7 and 15 kHz. The beam pattern is approximately omnidirectional. The acoustic source level is less than 192 dB re 1 μ Pa at 1 m.

In addition to the U.S. moorings described above, three new moorings will be deployed on behalf of Australia's national science agency the Commonwealth of Scientific and Industrial Research Organisation (CSIRO) Physical Oceanography group in the Totten Glacier region by the project team. These moorings will be retrieved approximately one year later by collaborators from other countries. Also, during this cruise, three CSIRO moorings that were deployed over a year ago in the western outlet of the Mertz-Ninnis Trough will be recovered. The recovery process and acoustic sources described above for the U.S. moorings will be used for recovery of the CSIRO moorings.

Icebreaking

Icebreaking is considered by NMFS to be a continuous sound and NMFS estimates that harassment occurs when marine mammals are exposed to continuous sounds at a received sound level of 120 dB SPL or above. The Palmer operates at approximately 3 kts in pack ice and can operate in pack ice up to 0.9 m (3 ft) thick. Potential takes of marine mammals may ensue from icebreaking activity in which the Palmer is expected to engage in Antarctic waters (i.e., along the George V and Oates Coast of East Antarctica, >65° South, between 140 and 165° East and between approximately 65 to 66° South and between 95 to 135° East). While breaking ice, the noise from the ship, including impact with ice, engine noise, and propeller cavitation, will exceed 120 dB (rms) continuously. If icebreaking does occur in Antarctic waters, NMFS, NSF and ASC expect it will occur during transit and non-seismic operations to gain access to coring, dredging, or other sampling locations and not during seismic airgun operations. The research activities and associated contingencies are designed to avoid areas of heavy sea ice condition. The buffer zone (160 dB [rms]) for the marine mammal Level B harassment threshold during the planned airgun activities is much smaller than the calculated radius during icebreaking. If the Palmer breaks ice during the survey within the Antarctic waters (within the Dumont d'Urville Sea or other areas of the Southern Ocean), seismic airgun operations will not be conducted concurrently.

In 2008, acousticians from Scripps Institution of Oceanography Marine Physical Laboratory and University of New Hampshire Center for Coastal and Ocean Mapping conducted measurements of SPLs of the Healy icebreaking under various conditions (Roth and Schmidt, 2010). The results indicated that the highest mean SPL (185 dB) was measured at survey speeds of 4 to 4.5 kts in conditions of 5/10 ice and greater. Mean SPL under conditions where the ship was breaking heavy ice by backing and ramming was actually lower (180 dB). In addition, when

backing and ramming, the vessel is essentially stationary, so the ensonified area is limited for a short period (on the order of minutes to tens of minutes) to the immediate vicinity of the vessel until the ship breaks free and once again makes headway.

The 120 dB received sound level radius around the Healy while icebreaking was estimated by researchers (USGS, 2010). Using a practical spreading model, a source level of 185 dB decays to 120 dB in about 21,544 m (70,684 ft). (Note: The proposed IHA used a spherical spreading model that predicted a distance of 1,750 m to 120 dB in deep water depths [greater than 1,000 m], this model was corroborated by Roth and Schmidt [2010]. A practical spreading model is now being used since the planned survey is occurring in intermediate water depths [between 100 and 1,000 m].). Therefore, as the ship travels through the ice, a swath 21.54 km (11.63 nmi) wide may be subject to sound levels greater than or equal to 120 dB. This results in potential exposure of 21,540 km² (6,380.1 nmi²) to sounds greater than or equal to 120 dB from icebreaking.

Data characterizing the sound levels generated by icebreaking activities conducted by the Palmer are not available; therefore, data for noise generating from an icebreaking vessel such as the U.S. Coast Guard Cutter (USCGC) Healy will be used as a proxy. It is noted that the Palmer is a smaller vessel and has less icebreaking capability than the U.S. Coast Guard's other polar icebreakers, being only capable of breaking ice up to 1 m thick at speeds of 3 kts (5.6 km/hr or 3 nmi). Therefore, the sound levels that may be generated by the Palmer are expected to be lower than the conservative levels estimated and measured for the Healy. Researchers will work to minimize time spent breaking ice as science operations are more difficult to conduct in icy conditions since the ice noise degrades the quality of the seismic and ADCP data and time spent breaking ice takes away from time supporting scientific research. Logistically, if the vessel were

in heavy ice conditions, researchers will not tow the airgun array and streamer, as this will likely damage equipment and generate noisy data. It is possible that the seismic survey can be performed in low ice conditions if the Palmer could generate an open path behind the vessel.

Because the Palmer is not rated to break multi-year ice routinely, operations generally avoid transiting through older ice (i.e., 2 years or older, thicker than 1 m). If sea ice is encountered during the cruise, it is anticipated the Palmer will proceed primarily through one year sea ice, and possibly some new, very thin ice, and will follow leads wherever possible. Satellite imagery from the Totten region documents that sea ice is at its minimum extent during the month of February. A recent image for the region, from November 21, 2013, shows that the sea ice is currently breaking up, with a significant coastal lead of open water. Based on a maximum sea ice extent of 250 km (135 nmi) and estimating that NSF and ASC will transit to the innermost shelf and back into open water twice, a round trip transit in each of the potential work regions, NSF and ASC estimate that the Palmer will actively break ice up to a distance of 1,000 km (540 nmi). Based on a ship's speed of 5 kts under moderate ice conditions, this distance represents approximately 108 hrs of icebreaking operations. It is noted that typical transit through areas primarily open water and containing brash ice or pancake ice will not be considered icebreaking.

Dates, Duration, and Specified Geographic Region

The planned project and survey sites are located in selected regions of the Dumont d'Urville Sea in the Southern Ocean off the coast of East Antarctica and focus on the Totten Glacier and Moscow University Ice Shelf, located on the Sabrina Coast, from greater than approximately 64° South and between approximately 95 to 135° East (see Figure 2 of the IHA application), and the Mertz Glacier and Cook Ice Shelf systems located on the George V and

Oates Coast, from greater than approximately 65° South and between approximately 140 to 165° East in International Waters. The planned study sites are characterized by heavy ice cover, with a seasonal break-up in the ice that structures biological patterns. The planned studies will occur in both areas, or entirely in one or the other, depending on ice conditions. Figure 3 of the IHA application illustrates the limited detailed bathymetry of the two study areas. Ice conditions encountered during the previous surveys in the region limited the area where bathymetric data could be collected. Water depths in the survey area range from approximately 100 to 1,000 m, and possibly exceeding 1,000 m in some areas. There is limited information on the depths in the study area and therefore more detailed information on bathymetry is not available. Figures 2 and 3 of the IHA application illustrate the limited available detailed bathymetry of the two planned study areas due to ice conditions encountered during previous surveys in the region. The planned seismic survey will be within an area of approximately 5,628 km² (1,640.9 nmi²). This estimate is based on the maximum number of kilometers for the seismic survey (2,800 km) times the predicted rms radii (m) based on modeling and empirical measurements (assuming 100% use of the two 105 in³ GI airguns in 100 to 1,000 m water depths) which was calculated to be 1,005 m (3,297.2 ft) (multiplied by two to calculate the diameter of the buffer zone).

The icebreaking will occur, as necessary, between approximately 66 to 70° South and between 140 to 165° East and between approximately 65 to 66° South and between 95 to 135° East. The total distance in the region of the vessel will travel include the seismic survey and transit to dredging or sampling locations and will represent approximately 5,600 km (3,023.8 nmi). Based on a maximum sea ice extent of 250 km (135 nmi) and estimating that NSF and ASC will transit to the innermost shelf and back into open water twice, a round trip transit in each of the potential work regions, NSF and ASC estimate that the Palmer will actively break ice

up to a distance of 1,000 km (540 nmi). Based on a ship's speed of 5 kts under moderate ice conditions, this distance represents approximately 108 hrs of icebreaking operations.

The Palmer is expected to depart from Hobart, Tasmania on approximately January 29, 2014 and return to Hobart, Tasmania on approximately March 16, 2014. Research operations will be over a span of 45-days, including to and from port. Ice-free or very low concentrations of sea ice are required in order to collect high quality seismic data and not impede passage of the vessel between sampling locations. This requirement restricts the cruise to operating in mid to late austral summer when the ice concentrations are typically the lowest. Some minor deviation from this schedule is possible, depending on logistics and weather (i.e., the cruise may depart earlier or be extended due to poor weather; there could be additional days of seismic operations if collected data are deemed to be of substandard quality).

NMFS outlined the purpose of the program in a previous notice for the proposed IHA (79 FR 464, January 3, 2014). The activities to be conducted have not changed between the proposed IHA notice and this final notice announcing the issuance of the IHA. For a more detailed description of the authorized action, including vessel and acoustic source specifications, metrics, characteristics of airgun pulses, predicted sound levels of airguns, etc., the reader should refer to the notice of the proposed IHA (79 FR 464, January 3, 2014), the IHA application, IEE/EA, and associated documents referenced above this section.

Comments and Responses

A notice of the proposed IHA for the NSF and ASC low-energy seismic survey was published in the Federal Register on January 3, 2014 (79 FR 464). During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission (Commission) and one private citizen. The comments are online at:

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. Following are the substantive comments and NMFS's responses:

Comment 1: The Commission recommends that NMFS require NSF and ASC to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed IHA – NMFS should make the same requirement for all future IHAs submitted by NSF, ASC, L-DEO, U.S. Geological Survey (USGS), Scripps Institution of Oceanography (SIO), or any other related entity.

Response: NMFS acknowledges the Commission's concerns about L-DEO's current model for estimating exclusion and buffer zones. We also acknowledge L-DEO did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area into their current model to estimate those zones for this IHA.

During a March 2013 meeting, L-DEO discussed the L-DEO model with the Commission, NMFS, and NSF. L-DEO compared the Gulf of Mexico (GOM) calibration measurements (Tolstoy et al., 2004; Tolstoy et al., 2009; Diebold et al., 2010) comparison with L-DEO model results, and explained correction factors used in previous EAs to adapt the deep-water model results for intermediate water depth environment. L-DEO showed that at the calibration sites the model overestimated the size of the exclusion zones and, therefore, is likely precautionary in most cases. Based on the best available information that the current model overestimates mitigation zones, we will not require L-DEO to re-estimate the proposed buffer and exclusion zones and associated number of marine mammal takes using operational and site-specific environmental parameters for this IHA.

However, we continue to work with the NSF and L-DEO on verifying the accuracy of

their model. L-DEO is currently analyzing whether received levels can be measured in real-time using the ship's hydrophone streamer to estimate the sound field around the ship and determine actual distances to the buffer and exclusion zones. Crone et al. (2013) are analyzing R/V Marcus G. Langseth streamer data collected in 2012 off the Washington coast shelf and slope to measure received levels in situ up to 8 km (4.3 nmi) away from the ship. While results confirm the role that bathymetry plays in propagation, it also confirmed that empirical measurements from the GOM survey used to inform buffer and exclusion zones in shallow water and model results adapted for intermediate water depths also over-estimated the size of the zones for the Washington survey. Preliminary results were presented in a poster session at the American Geophysical Union fall meeting in December 2013 (Crone et al., 2013; available at: <http://berna.ldeo.columbia.edu/agu2013/agu2013.pdf>) and a peer-reviewed journal publication is anticipated in 2014. When available, we will review and consider the final results and how they reflect on the L-DEO model.

Comment 2: The Commission recommends that NMFS (1) require NSF and ASC to revise its take estimates to include Level B harassment takes associated with the use of the single-beam and multi-beam echosounder when the airgun array is not firing and (2) follow a consistent approach of requiring the assessment of Level B harassment takes for those types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants, who propose to use such sources.

Response: As described in NSF's application and the NSF/USGS PEIS (2011), they expect the sound levels produced by the single-beam and multi-beam echosounder, ADCP, sub-bottom profiler sound sources to be exceeded by the sound levels produced by the airguns for the majority of the time. Additionally, because of the beam pattern and directionality of these

sources, combined with their lower source levels, it is far less likely that these sources (which are used in some capacity by the vast majority of vessels on the water) will take marine mammals independently from the takes that have already been estimated for the airguns. Therefore, NMFS does not believe it is necessary to authorize additional takes for these sources for the action. Nonetheless, NMFS is currently evaluating the broader use of these types of sources to determine under what specific circumstances coverage for incidental take would be advisable (or not) and is working on guidance that would outline a consistent recommended approach (to be used by applicants and NMFS) for addressing the potential impacts of these types of sources.

Comment 3: The Commission recommends that NMFS require NSF and ASC to estimate the numbers of marine mammals taken when the single-beam and multi-beam echosounder are used in the absence of the airgun array based on the 120 rather than 160 dB re: 1 μ Pa (rms) threshold.

Response: NMFS disagrees with the Commission's recommendation that NMFS require NSF and ASC to estimate the number of marine mammals taken when the single-beam and multi-beam echosounder, ADCP, and sub-bottom profiler are used in absence of the airgun array based on the 120 dB (rms) threshold rather than the 160 dB (rms) threshold. 160 dB (rms) is the appropriate threshold for these sound sources. Continuous sounds are those whose sound pressure level remains above that of the ambient sound, with negligibly small fluctuations in level (NIOSH, 1998; ANSI, 2005), while intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH, 1998). Thus, echosounder signals are not continuous sounds but rather intermittent sounds. Intermittent sounds can further be defined as either impulsive or non-impulsive. Impulsive sounds have been defined as sounds which are typically transient, brief (less than 1 second), broadband, and consist of a high peak pressure with

rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998). Echosounder signals also have durations that are typically very brief (less than 1 second), with temporal characteristics that more closely resemble those of impulsive sounds than non-impulsive sounds, which typically have more gradual rise times and longer decays (ANSI, 1995; NIOSH, 1998). With regard to behavioral thresholds, we therefore consider the temporal and spectral characteristics of echosounder signals to more closely resemble those of an impulsive sound than a continuous sound.

The Commission suggests that, for certain sources considered here, the interval between pulses would not be discernible to the animal, thus rendering them effectively continuous. However, an echosounder's "rapid staccato" of pulse trains is emitted in a similar fashion as odontocete echolocation click trains. Research indicates that marine mammals, in general, have extremely fine auditory temporal resolution and can detect each signal separately (e.g., Au et al., 1988; Dolphin et al., 1995; Supin and Popov, 1995; Mooney et al., 2009), especially for species with echolocation capabilities. Therefore, it is highly unlikely that marine mammals would perceive echosounder signals as being continuous.

In conclusion, echosounder, ADCP, and sub-bottom profiler signals are intermittent rather than continuous signals, and the fine temporal resolution of the marine mammal auditory system allows them to perceive these sounds as such. Further, the physical characteristics of these signals indicate a greater similarity to the way that intermittent, impulsive sounds are received. Therefore, the 160 dB threshold (typically associated with impulsive sources) is more appropriate than the 120 dB threshold (typically associated with continuous sources) for estimating takes by behavioral harassment incidental to use of such sources.

Comment 4: The Commission recommends that NMFS consult with experts in the field

of acoustics and marine mammal hearing to revise the Level B harassment thresholds for behavior to specify threshold levels that would be more appropriate for a wider range of sound sources, including shallow penetration sub-bottom profilers, echosounders, and side-scan sonars – if NMFS plans to propose behavior thresholds for seismic surveys separate from other activities, include thresholds for all types of sources that are used, not just for airguns.

Response: NMFS agrees with the Commission’s recommendation to revise existing acoustic criteria and thresholds as necessary to specify threshold levels that would be more appropriate for a wider range of sound sources, and are currently in process of producing such revisions. In particular, NMFS recognizes the importance of context (e.g., behavioral state of animals, distance) in behavioral responses. The current behavioral categorization (i.e., impulse versus continuous) does not account for context and is not appropriate for all sound sources. Thus, updated NOAA Acoustic Guidance <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm>) will more appropriately categorize behavioral harassment criteria by activity type.

Comment 5: The Commission recommends that NMFS consult with the funding agency (i.e., NSF) and individual applicants (e.g., ASC, L-DEO, SIO, USGS, etc.) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken – the assessment should account for applicable $g(0)$ and $f(0)$ values.

Response: There will be periods of transit time during the cruise, and PSOs will be on watch prior to and after the seismic airgun operations and icebreaking portions of the surveys, in addition to during the surveys. The collection of this visual observational data by PSOs may contribute to baseline data on marine mammals (presence/absence) and provide some

generalized support for estimated take numbers (as well as providing data regarding behavioral responses to seismic operation that are observable at the surface), but is unlikely that the information gathered from these cruises alone would result in any statistically robust conclusions for any particular species because of the small number of animals typically observed.

NMFS is currently working to develop recommendations for how applicants can appropriately correct marine mammal detections to better estimate the number of animals likely taken during specified activities, in consideration of those that are not detected.

Comment 6: The Commission recommends that NMFS (1) provide a full 30-day public review and comment period that starts with the publication of notices in the printed edition of the Federal Register and (2) allow sufficient time after the close of the comment period and prior to issuance of an IHA to allow the agency to analyze, consider, respond to, and make any necessary changes to the proposed authorization of NMFS's rationale based on those comments.

Response: Section 101(a)(5)(D) of the MMPA establishes a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. NMFS's standard procedure is to have a 30-day public comment period that extends from publication in the Federal Register to the closure date specified in the notice of the proposed IHA (with an additional 2 days for those that check the electronic version available online). The public was afforded a 30-day comment period to review and submit information and suggestions on the proposed IHA with the electronic availability of the notice of proposed IHA and making preliminary determinations available on the Federal Register's website on December 31, 2013. On January 3, 2014, NMFS published the notice in the Federal Register (79 FR 464). On January 7, 2014, NMFS published a notice in the Federal Register correcting the dates in the issue of Friday, January 3, 2014 "...on page 464, in the first column, in the 41st

through 42nd lines, ‘February 3, 2014 should read ‘January 30, 2014’ (79 FR 816). NMFS fully intends to have a 30-day public comment period on all future notices of proposed IHA published in the Federal Register, but in this particular case operational needs supported the use of a 30-day public comment period from electronic filing to closure in order to ensure that NMFS had adequate time to address public comments before making a decision of whether to issue an IHA to NSF and ASC in time for the needed start date of the seismic survey.

NMFS has been issuing MMPA authorizations to NSF to conduct these activities for approximately 10 years, which has allowed NMFS to develop relatively standard mitigation and monitoring requirements for these activities, so rarely more than one or two public comments are received. NMFS received only comments from the Commission and a private citizen during the 30-day public review and comment period. NMFS believes it has sufficient time after the close of the comment period and prior to issuance of an IHA to allow the agency to analyze, consider, respond to, and make any necessary changes to the proposed IHA of the rationale based on those comments.

Comment 7: An individual opposes the issuance of the IHA to NSF and ASC, who also states that NSF and ASC’s project is killing marine mammals.

Response: As described in detail in the Federal Register notice for the proposed IHA (79 FR 464, January 3, 2014), as well as in this document, NMFS determined that NSF and ASC’s low-energy seismic survey will not cause injury, serious injury, or mortality to marine mammals. The required monitoring and mitigation measures that NSF and ASC will implement during the low-energy seismic survey will further reduce the adverse effects on marine mammals to the lowest levels practicable. NMFS anticipates only behavioral disturbance to occur during the conduct of the low-energy seismic survey.

Description of the Marine Mammals in the Specified Geographic Area of the Specified Activity

The marine mammals that generally occur in the planned action area belong to three taxonomic groups: mysticetes (baleen whales), odontocetes (toothed whales), and pinnipeds (seals and sea lions). The marine mammal species that potentially occur within the Southern Ocean in proximity to the action area in the Dumont d'Urville Sea include 28 species of cetaceans and 6 species of pinnipeds.

The Dumont d'Urville Sea may be a feeding ground for many of these marine mammals. Many of the species that may be potentially present in the study area seasonally migrate to higher latitudes along the east coast of Antarctica. In general, most species (except for the killer whale) migrate north in the middle of the austral winter and return to Antarctica in the early austral summer. Some species, particularly Antarctic minke (Balaenoptera bonaerensis) and killer whales (Orcinus orca), are expected to be present in higher concentrations along the ice edge (SCAR, 2002). The 6 species of pinnipeds that are found in the Southern Ocean and which may be present in the planned study area include the crabeater (Lebodon carcinophagus), leopard (Hydrurga leptonyx), Weddell (Leptonychotes weddellii), Ross (Ommatophoca rossii), southern elephant (Mirounga leonina), and Antarctic fur seal (Arctocephalus gazella). Many of these pinniped species breed on either the pack ice or sub-Antarctic islands. Since the southern elephant seal and Antarctic fur seal haul-outs and rookeries are located on sub-Antarctic islands and prefer beaches, they are more common north of the seasonally shifting pack ice found in the study area; therefore, these two species have not been considered further. Marine mammal species listed as endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.), include the southern right (Eubalaena australis), humpback (Megaptera novaeangliae), sei (Balaenoptera borealis), fin (Balaenoptera physalus), blue (Balaenoptera

musculus), and sperm (Physeter macrocephalus) whale. Of those endangered species, the humpback, sei, fin, blue, and sperm whale are likely to be encountered in the survey area.

Various national Antarctic research programs along the coast of East Antarctica have conducted scientific cruises that included data on marine mammal sightings. These observations were made primarily between 30° East and 170 ° East and north to 60 ° South. The reported cetacean sightings are summarized in Tables 5 to 7 of the IHA application. For pinnipeds, observations made during a scientific cruise over a 13-day period in East Antarctica are summarized in Table 9 of the IHA application. These observations were made below 60 ° South and between 110 ° East to 165 ° East and include sightings of individual animals in the water as well as individuals that were hauled-out (i.e., resting on the surface of the sea ice).

Records from the International Whaling Commission's Southern Ocean Whale and Ecosystem Research (IWC-SOWER) circumpolar cruises were also considered. In addition to the 14 species known to occur in the Dumont d'Urville Sea of the Southern Ocean, there are 18 cetacean species with ranges that are known to occur in the sub-Antarctic waters of the study area which may also feed and/or migrate to the Southern Ocean during the austral summer, these include the southern right, pygmy right (Caperea marginata), Bryde's (Balaenoptera brydei), dwarf minke (Balaenoptera acutorostrata spp.), pygmy blue (Balaenoptera musculus breviceuda), pygmy dwarf sperm whale (Kogia breviceps), Arnoux's beaked (Berardius arnuxii), Blainville's beaked whale (Mesoplodon densirostris), Cuvier's beaked (Ziphius cavirostris), Shepherd's beaked (Tasmacetus shepherdi), Southern bottlenose (Hyperoodon planifrons), Andrew's beaked (Mesoplodon bowdoini), Hector's beaked (Mesoplodon hectori), Gray's beaked (Mesoplodon grayi), strap-toothed beaked (Mesoplodon layardii), spade-toothed beaked (Mesoplodon traversii), southern right whale dolphin (Lissodelphis peronii), Dusky (Lagenorhynchus

obscurus), and bottlenose dolphin (Tursiops truncatus). However, these species have not been sighted and are not expected to occur where the planned activities will take place. These species are not considered further in this document. Table 3 (below) presents information on the abundance, distribution, population status, conservation status, and population trend of the species of marine mammals that may occur in the planned study area during January to March 2014.

Table 3. The habitat, regional abundance, and conservation status of marine mammals that may occur in or near the low-energy seismic survey area in the Antarctic area of the Southern Ocean (See text and Tables 4 in NSF and ASC’s application for further details).

Species	Habitat	Population Estimate	ESA ¹	MMPA ²	Population Trend
Mysticetes					
Southern right whale (<u>Eubalaena australis</u>)	Coastal, pelagic	8,000 ³ to 15,000 ⁴	EN	D	Increasing
Pygmy right whale (<u>Caperea marginata</u>)	Coastal, pelagic	NA	NL	NC	NA
Humpback whale (<u>Megaptera novaeangliae</u>)	Pelagic, nearshore waters, and banks	35,000 to 40,000 ³ - Worldwide 9,484 ⁵ – Scotia Sea and Antarctica Peninsula	EN	D	Increasing
Dwarf minke whale (<u>Balaenoptera acutorostrata</u> sub-species)	Pelagic and coastal	NA	NL	NC	NA
Antarctic minke whale (<u>Balaenoptera bonaerensis</u>)	Pelagic, ice floes	Several 100,000 ³ - Worldwide 18,125 ⁵ - Scotia Sea and Antarctica Peninsula	NL	NC	Stable
Bryde’s whale (<u>Balaenoptera brydei</u>)	Pelagic and coastal	NA	NL	NC	NA
Sei whale (<u>Balaenoptera borealis</u>)	Primarily offshore, pelagic	80,000 ³ - Worldwide	EN	D	NA
Fin whale (<u>Balaenoptera physalus</u>)	Continental slope, pelagic	140,000 ³ - Worldwide 4,672 ⁵ - Scotia Sea and Antarctica Peninsula	EN	D	NA
Blue whale (<u>Balaenoptera musculus</u>)	Pelagic, shelf, coastal	8,000 to 9,000 ³ - Worldwide 1,700 ⁶ - Southern Ocean	EN	D	NA
Odontocetes					
Sperm whale (<u>Physeter macrocephalus</u>)	Pelagic, deep sea	360,000 ³ – Worldwide 9,500 ³ - Antarctic	EN	D	NA
Pygmy sperm whale (<u>Kogia breviceps</u>)	Pelagic, slope	NA	NL	NC	NA
Arnoux’s beaked whale (<u>Berardius arnuxii</u>)	Pelagic	NA	NL	NC	NA
Blainville’s beaked whale (<u>Mesoplodon densirostris</u>)	Pelagic	NA	NL	NC	NA
Cuvier’s beaked whale (<u>Ziphius</u>)	Pelagic	NA	NL	NC	NA

<u>cavirostris</u>)					
Shepherd's beaked whale (<u>Tasmacetus shepherdi</u>)	Pelagic	NA	NL	NC	NA
Southern bottlenose whale (<u>Hyperoodon planifrons</u>)	Pelagic	500,000 ³ – South of Antarctic Convergence	NL	NC	NA
Andrew's beaked whale (<u>Mesoplodon bowdoini</u>)	Pelagic	NA	NL	NC	NA
Hector's beaked whale (<u>Mesoplodon hectori</u>)	Pelagic	NA	NL	NC	NA
Gray's beaked whale (<u>Mesoplodon grayi</u>)	Pelagic	NA	NL	NC	NA
Strap-toothed beaked whale (<u>Mesoplodon layardii</u>)	Pelagic	NA	NL	NC	NA
Spade-toothed beaked whale (<u>Mesoplodon traversii</u>)	Pelagic	NA	NL	NC	NA
Killer whale (<u>Orcinus orca</u>)	Pelagic, shelf, coastal, pack ice	80,000 ³ – South of Antarctic Convergence 25,000 ⁷ - Southern Ocean	NL	NC	NA
Long-finned pilot whale (<u>Globicephala melas</u>)	Pelagic, shelf, coastal	200,000 ^{3,8} – South of Antarctic Convergence	NL	NC	NA
Bottlenose dolphin (<u>Tursiops truncatus</u>)	Offshore, inshore, coastal, estuaries	>625,500 ³ - Worldwide	NL	NC	NA
Southern right whale dolphin (<u>Lissodelphis peronii</u>)	Pelagic	NA	NL	NC	NA
Dusky dolphin (<u>Lagenorhynchus obscurus</u>)	Coastal, continental shelf and slope	NA	NL	NC	NA
Hourglass dolphin (<u>Lagenorhynchus cruciger</u>)	Pelagic, ice edge	144,000 ³	NL	NC	NA
Spectacled porpoise (<u>Phocoena dioptrica</u>)	Coastal, pelagic	NA	NL	NC	NA
Pinnipeds					
Crabeater seal (<u>Lobodon carcinophaga</u>)	Coastal, pack ice	5,000,000 to 15,000,000 ^{3,9}	NL	NC	Increasing
Leopard seal (<u>Hydrurga</u>	Pack ice, sub-Antarctic	220,000 to 440,000 ^{3,10}	NL	NC	NA

<u>leptonyx</u>)	islands				
Ross seal (<u>Ommatophoca</u> <u>rossii</u>)	Pack ice, smooth ice floes, pelagic	130,000 ³	NL	NC	NA
Weddell seal (<u>Leptonychotes</u> <u>weddellii</u>)	Fast ice, pack ice, sub- Antarctic islands	500,000 to 1,000,000 ^{3,11}	NL	NC	NA
Southern elephant seal (<u>Mirounga</u> <u>leonina</u>)	Coastal, pelagic, sub- Antarctic waters	640,000 ¹² to 650,000 ³	NL	NC	Decreasing, increasing or stable depending on breeding population
Antarctic fur seal (<u>Arctocephalus</u> <u>gazella</u>)	Shelf, rocky habitats	1,600,000 ¹³ to 3,000,000 ³	NL	NC	Increasing

NA = Not available or not assessed.

¹ U.S. Endangered Species Act: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.

² U.S. Marine Mammal Protection Act: D = Depleted, S = Strategic, NC = Not Classified.

³ Jefferson et al., 2008.

⁴ Kenney, 2009.

⁵ Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) survey area (Reilly et al., 2004)

⁶ Sears and Perrin, 2009.

⁷ Ford, 2009.

⁸ Olson, 2009.

⁹ Bengston, 2009.

¹⁰ Rogers, 2009.

¹¹ Thomas and Terhune, 2009.

¹² Hindell and Perrin, 2009.

¹³ Arnould, 2009.

Refer to sections 3 and 4 of NSF and ASC's IHA application for detailed information regarding the abundance and distribution, population status, and life history and behavior of these other marine mammal species and their occurrence in the project area. The IHA application also presents how NSF and ASC calculated the estimated densities for the marine mammals in the survey area. NMFS has reviewed these data and determined them to be the best available scientific information for the purposes of the IHA.

Potential Effects on Marine Mammals

Acoustic stimuli generated by the operation of the airguns, which introduce sound into the marine environment, may have the potential to cause Level B harassment of marine mammals in the planned survey area. The effects of sounds from airgun operations might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects (Richardson et al., 1995; Gordon et al., 2004; Nowacek et al., 2007; Southall et al., 2007). Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not an injury (Southall et al., 2007). Although the possibility cannot be entirely excluded, it is unlikely that the planned project will result in any cases of temporary or permanent hearing impairment, or any significant non-auditory physical or physiological effects. Based on the available data and studies described here, some behavioral disturbance is expected. A more comprehensive review of these issues can be found in the "Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research funded by the National Science Foundation or conducted by the U.S. Geological Survey" (NSF/USGS, 2011).

The notice of the proposed IHA (79 FR 464, January 3, 2014) included a discussion of

the effects of sounds from airguns, icebreaking activities, core and dredge sampling, and other acoustic devices and sources on mysticetes, odontocetes, and pinnipeds including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects. The notice of the proposed IHA (79 FR 464, January 3, 2014) also included a discussion of the effects of vessel movement and collisions as well as entanglement. NMFS refers readers to NSF and ASC's application and IEE/EA for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels.

Anticipated Effects on Marine Mammal Habitat, Fish, and Invertebrates

NMFS included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish, fisheries, and invertebrates in the notice of the proposed IHA (79 FR 464, January 3, 2014). The seismic survey will not result in any permanent impact on habitats used by the marine mammals in the survey area, including the food sources they use (i.e., fish and invertebrates), and there will be no physical damage to any habitat. While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to habitat is temporary and inconsequential, which was considered in further detail in the notice of the proposed IHA (79 FR 464, January 3, 2014), as behavioral modification. The main impact associated with the activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

Mitigation

In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its

habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and the availability of such species or stock for taking for certain subsistence uses.

NSF and ASC reviewed the following source documents and have incorporated a suite of appropriate mitigation measures into their project description.

(1) Protocols used during previous NSF and USGS-funded seismic research cruises as approved by NMFS and detailed in the recently completed NSF/USGS PEIS (2011);

(2) Previous IHA applications and IHAs approved and authorized by NMFS; and

(3) Recommended best practices in Richardson *et al.* (1995), Pierson *et al.* (1998), and Weir and Dolman, (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, NSF, ASC and/or its designees are required to implement the following mitigation measures for marine mammals:

(1) Exclusion zones around the sound source;

(2) Speed and course alterations;

(3) Shut-down procedures; and

(4) Ramp-up procedures.

Exclusion Zones – During pre-planning of the cruise, the smallest airgun array was identified that could be used and still meet the geophysical scientific objectives. NSF and ASC use radii to designate exclusion and buffer zones and to estimate take for marine mammals. Table 4 (see below) shows the distances at which one would expect to receive three sound levels (160, 180, and 190 dB) from the two GI airgun array. The 180 and 190 dB level shut-down criteria are applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000). NSF and ASC used these levels to establish the exclusion and buffer zones.

Received sound levels have been modeled by L-DEO for a number of airgun configurations, including two 45 in³ Nucleus G airguns, in relation to distance and direction from the airguns (see Figure 2 of the IHA application). In addition, propagation measurements of pulses from two GI airguns have been reported for shallow water (approximately 30 m [98.4 ft] depth in the GOM (Tolstoy *et al.*, 2004). However, measurements were not made for the two GI airguns in deep water. The model does not allow for bottom interactions, and is most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the GI airguns where sound levels are predicted to be 190, 180, and 160 dB re 1 μ Pa (rms) in intermediate and deep water were determined (see Table 4 below).

Empirical data concerning the 190, 180, and 160 dB (rms) distances were acquired for various airgun arrays based on measurements during the acoustic verification studies conducted by L-DEO in the northern GOM in 2003 (Tolstoy *et al.*, 2004) and 2007 to 2008 (Tolstoy *et al.*, 2009). Results of the 36 airgun array are not relevant for the two GI airguns to be used in the planned survey. The empirical data for the 6, 10, 12, and 20 airgun arrays indicate that, for deep water, the L-DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.*, 2004). Measurements were not made for the two GI airgun array in deep water; however, NSF and ASC propose to use the exclusion zone radii predicted by L-DEO's model for the planned GI airgun operations in intermediate and deep water, although they are likely conservative given the empirical results for the other arrays.

Based on the modeling data, the outputs from the pair of 45 in³ or 105 in³ GI airguns planned to be used during the seismic survey are considered a low-energy acoustic source in the NSF/USGS PEIS (2011) for marine seismic research. A low-energy seismic source was defined in the NSF/USGS PEIS as an acoustic source whose received level at 100 m is less than 180 dB.

The NSF/USGS PEIS also established for these low-energy sources, a standard exclusion zone of 100 m for all low-energy sources in water depths greater than 100 m. This standard 100 m exclusion zone will be used during the planned low-energy seismic survey. The 180 and 190 dB (rms) radii are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000); these levels were used to establish exclusion zones. Therefore, the assumed 180 and 190 dB radii are 100 m for intermediate and deep water, respectively. If the PSO detects a marine mammal(s) within or about to enter the appropriate exclusion zone, the airguns will be shut-down immediately.

Table 4 summarizes the predicted distances at which sound levels (160, 180, and 190 dB [rms]) are expected to be received from the two airgun array (45 in³ or 105 in³) operating in intermediate (100 to 1,000 m) and deep water (greater than 1,000 m) depths.

Table 4. Predicted and modeled (two 45 in³ and two 105 in³ GI airgun array) distances to which sound levels \geq 190, 180 and 160 dB re: 1 μ Pa (rms) could be received in intermediate and deep water during the planned low-energy seismic survey in the Dumont d'Urville Sea of the Southern Ocean, January to March 2014. No airgun operations will occur in shallow (<100 m) water depths.

Source and Total Volume	Tow Depth (m)	Water Depth (m)	Predicted RMS Radii Distances (m) for 2 GI Airgun Array		
			160 dB	180 dB	190 dB
Two 45 in ³ GI Airguns (90 in ³)	3	Intermediate (100 to 1,000)	600 (1,968.5 ft)	100 (328ft)	100
Two 45 in ³ GI Airguns (90 in ³)	3	Deep (>1,000)	400 (1,312.3 ft)	100	100
Two 105 in ³ GI Airguns (210 in ³)	3	Intermediate (100 to 1,000)	1,005 (3,297.2 ft)	100	100
Two 105 in ³ GI Airguns (210 in ³)	3	Deep (>1,000)	670 (2,198.2 ft)	100	100

Speed and Course Alterations – If a marine mammal is detected outside the exclusion zone and, based on its position and direction of travel (relative motion), is likely to enter the exclusion zone, changes of the vessel's speed and/or direct course will be considered if this does not compromise operational safety or damage the deployed equipment. This will be done if operationally practicable while minimizing the effect on the planned science objectives. For marine seismic surveys towing large streamer arrays, however, course alterations are not typically implemented due to the vessel's limited maneuverability. After any such speed and/or course alteration is begun, the marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach within the exclusion zone. If the marine mammal appears likely to enter the exclusion zone, further mitigation actions will be taken, including further speed and/or course alterations, and/or shut-down of the airgun(s). Typically, during seismic operations, the source vessel is unable to change speed or course, and one or more alternative mitigation measures will need to be implemented.

Shut-down Procedures - NSF and ASC will shut-down the operating airgun(s) if a marine mammal is detected outside the exclusion zone for the airgun(s), and if the vessel's speed and/or course cannot be changed to avoid having the animal enter the exclusion zone, the seismic source will be shut-down before the animal is within the exclusion zone. Likewise, if a marine mammal is already within the exclusion zone when first detected, the seismic source will be shut-down immediately.

Following a shut-down, NSF and ASC will not resume airgun activity until the marine mammal has cleared the exclusion zone. NSF and ASC will consider the animal to have cleared the exclusion zone if:

- A PSO has visually observed the animal leave the exclusion zone, or
- A PSO has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (i.e., small odontocetes and pinnipeds), or 30 minutes for species with longer dive durations (i.e., mysticetes and large odontocetes, including sperm, killer, and beaked whales).

Although power-down procedures are often standard operating practice for seismic surveys, they are not going to be used during this planned seismic survey because powering-down from two airguns to one airgun will make only a small difference in the exclusion zone(s) – but probably not enough to allow continued one-airgun operations if a marine mammal came within the exclusion zone for two airguns.

Ramp-up Procedures – Ramp-up of an airgun array provides a gradual increase in sound levels and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to “warn” marine mammals in the vicinity of the airguns and to provide the time for them to leave the area avoiding any potential injury or impairment of their hearing abilities. NSF and ASC will follow a ramp-up procedure when the airgun array begins operating after a specified period without airgun operations or when a shut-down has exceeded that period. NSF and ASC plans that, for the present cruise, this period will be approximately 15 minutes. SIO, L-DEO, and USGS have used similar periods (approximately 15 minutes) during previous low-energy seismic surveys.

Ramp-up will begin with a single GI airgun (45 or 105 in³). The second GI airgun (45 or 105 in³) will be added after 5 minutes. During ramp-up, the PSOs will monitor the exclusion

zone, and if marine mammals are sighted, a shut-down will be implemented as though both GI airguns were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of operations in either daylight or nighttime, NSF and ASC will not commence the ramp-up. Given these provisions, it is likely that the airgun array will not be ramped-up from a complete shut-down at night or in thick fog, because the outer part of the exclusion zone for that array will not be visible during those conditions. If one airgun has operated, ramp-up to full power will be permissible at night or in poor visibility, on the assumption that marine mammals will be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away if they choose. A ramp-up from a shut-down may occur at night, but only where the exclusion zone is small enough to be visible. NSF and ASC will not initiate a ramp-up of the airguns if a marine mammal is sighted within or near the applicable exclusion zones during the day or close to the vessel at night.

NMFS has carefully evaluated the applicant's mitigation measures and has considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. NMFS's evaluation of potential measures included consideration of the following factors in relation to one another:

- (1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- (2) The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- (3) The practicability of the measure for applicant implementation.

Based on NMFS's evaluation of the applicant's measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined that the mitigation measures provide the means of effecting the least practicable impacts on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for IHAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area.

Monitoring

NSF and ASC will conduct marine mammal monitoring during the project, in order to implement the mitigation measures that require real-time monitoring, and to satisfy the monitoring requirements of the IHA. NSF and ASC's "Monitoring Plan" is described below this section. The monitoring work described here has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same regions. NSF and ASC will discuss coordination of their monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

Vessel-based Visual Monitoring

NSF and ASC's PSOs will be based aboard the seismic source vessel and will watch for marine mammals near the vessel during icebreaking activities, daytime airgun operations (austral

summer) and during any ramp-ups of the airguns at night. Generally, nighttime operations of the airguns are not anticipated. PSOs will also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations and after an extended shut-down (i.e., greater than approximately 15 minutes for this low-energy seismic survey). When feasible, PSOs will conduct observations during daytime periods when the seismic system is not operating (such as during transits) for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on PSO observations, the airguns will be shut-down when marine mammals are observed within or about to enter a designated exclusion zone. The exclusion zone is a region in which a possibility exists of adverse effects on animal hearing or other physical effects.

During seismic operations in the Dumont d'Urville Sea of the Southern Ocean, at least two PSOs will be based aboard the Palmer. At least one PSO will stand watch at all times while the Palmer is operating airguns during the low-energy seismic survey; this procedure will also be followed when the vessel is conducting icebreaking during transit. NSF and ASC will appoint the PSOs with NMFS's concurrence. The lead PSO will be experienced with marine mammal species in the Southern Ocean, the second PSO will receive additional specialized training from the PSO to ensure that they can identify marine mammal species commonly found in the Southern Ocean. Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. During the majority of seismic operations, at least one PSO will be on duty from observation platforms (i.e., the best available vantage point on the source vessel) to monitor marine mammals near the seismic vessel. PSO(s) will be on duty in shifts no longer than 4 hours in duration. Other crew will also be instructed to assist in detecting marine mammals and implementing mitigation requirements (if practical). Before the start of the low-

energy seismic survey, the crew will be given additional instruction on how to do so. (Note: because of the high latitude locations of the study areas, twilight/darkness conditions are expected to be limited to between 3 and 6 hours per day during the planned action.)

The Palmer is a suitable platform for marine mammal observations and will serve as the platform from which PSOs will watch for marine mammals before and during seismic operations. Two locations are likely as observation stations onboard the Palmer. Observing stations are located on the bridge level, with the PSO eye level at approximately 16.5 m (54.1 ft) above the waterline and the PSO will have a good view around the entire vessel. In addition, there is an aloft observation tower for the PSO approximately 24.4 m (80.1 ft) above the waterline that is protected from the weather, and affords PSOs an even greater view. Standard equipment for PSOs will be reticle binoculars. Night-vision equipment will not be available or required due to the constant daylight conditions during the Antarctic summer. The PSOs will be in communication with ship's officers on the bridge and scientists in the vessel's operations laboratory, so they can advise promptly of the need for avoidance maneuvers or seismic source shut-down. Observing stations will be at the bridge level and the aloft observation tower. The approximate view around the vessel from the bridge is 270° and 360° from the aloft observation tower. During daytime, the PSO(s) will scan the area around the vessel systematically with reticle binoculars (e.g., 7 x 50 Fujinon FMTRC-SX) and the naked eye. These binoculars will have a built-in daylight compass. Estimating distances is done primarily with the reticles in the binoculars. The PSO(s) will be in direct (radio) wireless communication with ship's officers on the bridge and scientists in the vessel's operations laboratory during seismic operations, so they can advise the vessel operator, science support personnel, and the science party promptly of the need for avoidance maneuvers or a shut-down of the seismic source. PSOs will monitor for the

presence pinnipeds and cetaceans during icebreaking activities, and will be limited to those marine mammal species in proximity to the ice margin habitat. Observations within the buffer zone will also include pinnipeds that may be present on the surface of the sea ice (i.e., hauled-out) and that could potentially dive into the water as the vessel approaches, indicating disturbance from noise generated by icebreaking activities.

When marine mammals are detected within or about to enter the designated exclusion zone, the airguns will immediately be shut-down if necessary. The PSO(s) will continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations will not resume until the animal is confirmed to have left the exclusion zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, killer, and beaked whales).

PSO Data and Documentation

PSOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data will be used to estimate numbers of animals potentially “taken” by harassment (as defined in the MMPA). They will also provide information needed to order a shut-down of the airguns when a marine mammal is within or near the exclusion zone. Observations will also be made during icebreaking activities as well as daytime periods when the Palmer is underway without seismic operations (i.e., transits, to, from, and through the study area) to collect baseline biological data.

When a sighting is made, the following information about the sighting will be recorded:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic

vessel, sighting cue, apparent reaction to the seismic source or vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, wind force, visibility, and sun glare.

The data listed under (2) will also be recorded at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

All observations, as well as information regarding ramp-ups or shut-downs will be recorded in a standardized format. Data will be entered into an electronic database. The data accuracy will be verified by computerized data validity checks as the data are entered and by subsequent manual checking of the database by the PSOs at sea. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide the following information:

1. The basis for real-time mitigation (airgun shut-down).
2. Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS.
3. Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.
4. Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity.
5. Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

NSF and ASC will submit a comprehensive report to NMFS within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near the operations. The report submitted to NMFS will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations and all marine mammal sightings (i.e., dates, times, locations, activities, and associated seismic survey activities). The report will include:

- Summaries of monitoring effort – total hours, total distances, and distribution of marine mammals through the study period accounting for Beaufort sea state and other factors affecting visibility and detectability of marine mammals;
- Analyses of the effects of various factors influencing detectability of marine mammals including Beaufort sea state, number of PSOs, and fog/glare;
- Species composition, occurrence, and distribution of marine mammals sightings including date, water depth, numbers, age/size/gender, and group sizes; and analyses of the effects of seismic operations;
- Sighting rates of marine mammals during periods with and without airgun activities (and other variables that could affect detectability);
- Initial sighting distances versus airgun activity state;
- Closest point of approach versus airgun activity state;
- Observed behaviors and types of movements versus airgun activity state;
- Numbers of sightings/individuals seen versus airgun activity state; and
- Distribution around the source vessel versus airgun activity state.

The report will also include estimates of the number and nature of exposures that could result in “takes” of marine mammals by harassment or in other ways. After the report is considered final, it will be publicly available on the NMFS website at:

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm#iha>.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), NSF and ASC will immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel’s speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and

- Photographs or video footage of the animal(s) (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with NSF and ASC to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. NSF and ASC may not resume their activities until notified by NMFS via letter or email, or telephone.

In the event that NSF and ASC discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), NSF and ASC will immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401, and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with NSF and ASC to determine whether modifications in the activities are appropriate.

In the event that NSF and ASC discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate or advanced decomposition, or scavenger damage), NSF and ASC will report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401, and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov, within 24 hours of discovery. NSF and ASC will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS. Activities may continue while NMFS reviews the circumstances of the incident.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Level B harassment of marine mammals is anticipated to result from the low-energy marine seismic survey in the Dumont d'Urville Sea off the coast of East Antarctica. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array and icebreaking activities are expected to result in the behavioral disturbance of some marine mammals. There is no evidence that the planned activities could result in injury, serious injury, or mortality for which NSF and ASC seeks the IHA. The required mitigation and monitoring measures are expected to minimize any potential risk for injury, serious injury, or mortality.

The following sections describe NSF and ASC's methods to estimate take by incidental harassment and present the applicant's estimates of the numbers of marine mammals that could be affected during the low-energy seismic survey in the Dumont d'Urville Sea off the coast of East Antarctica. The estimates are based on a consideration of the number of marine mammals that could be harassed during the approximately 2,800 km (1,511.9 nmi) of seismic airgun operations with the two GI airgun array to be used and 1,000 km of icebreaking activities.

During simultaneous operations of the airgun array and the other sound sources, any marine mammals close enough to be affected by the single and multi-beam echosounders,

pingers, ADCP, sub-bottom profiler, etc. would already be affected by the airguns. During times when the airguns are not operating, it is unlikely that marine mammals will exhibit more than minor, short-term responses to the echosounders, ADCPs, and sub-bottom profiler given their characteristics (e.g., narrow, downward-directed beam) and other considerations described previously. Therefore, for this activity, take was not authorized specifically for these sound sources beyond that which is already authorized for airguns and icebreaking activities.

There are no stock assessments and very limited population information available for marine mammals in the Dumont d'Urville Sea. Published estimates of marine mammal densities are not available for the Dumont d'Urville Sea. Sighting data from the Australian Antarctic Division's (AAD) BROKE-West surveys (1999) were used to determine and estimate marine mammals densities for mysticetes and odontocetes and AAD data components for pinnipeds (Southwell et al., 2008; 2012), which were not available for the seismic survey's action area in the Dumont d'Urville Sea. The specific densities used for crabeater seals are based on data from Southwell et al. (2008) and for Weddell seals is based on NMFS Southwest Fisheries Science Center (2013) and IUCN data. While population density data for cetaceans in the Southern Ocean are sparse to nonexistent, reported sightings data from previous research cruises suggest cetaceans such as those identified in Table 12 of the IHA application span a range greater than 4,000 km (2,159.8 nmi) off the coast of East Antarctica. The AAD BROKE-West survey was not specifically designed to quantify marine mammals. Observations from this survey represent sightings from a discrete time period. The data were in terms of animals sighted per time unit, and the sighting data were then converted to an areal density (number of animals per square km) by multiplying the number of animals observed by the estimated area observed during the

survey. As such, some marine mammals that were present in the area may not have been observed.

The estimated number of cetaceans and pinnipeds that may be potentially exposed to the seismic airgun operations and icebreaking activities were based on sighting data from previous research cruises over a 52-day period and 13-day period. Some of the AAD sighting data were used as the basis for estimating take included “unidentified whale” species, this category was retained and pro-rated to the other species because environmental conditions may be present during the planned action to limit identification of observed cetaceans. The estimated frequency of sightings data for cetaceans incorporates a correction factor of 5 that assumes only 20% of the animals present were reported due to sea ice and other conditions that may have hindered observation. The 20% factor was intended to conservatively account for this. A 40% correction factor to account for seals that may be in the water versus those hauled-out on ice surface was used for pinnipeds in the proposed IHA, but has since been removed. The 40% correction factor was removed as pinnipeds hauled-out on ice often flush into the water and may be exposed to sounds from the airgun operations or icebreaking activities from the Palmer. The correction factor for pinnipeds was conservatively based on Southwell et al. (2012), which estimated 20 to 40% of crabeater seals may be in the water in a particular area while the rest are hauled-out. The correction factor took into consideration some pinnipeds may not be observed due to poor visibility conditions.

Sightings data were collected by the AAD; however, the AAD methodology was not described. Density is generally reported in the number of animals per km or square km. Estimated area observed by observers was calculated by using the average vessel speed (5.6 km/hr) times the estimated hours of the survey to estimate the total distance covered for each of

the surveys. This was then converted from the linear distance into an area by assuming a width of 5 km that could be reliably visually surveyed. Therefore, the estimated area was 5,753 km² (1,677.3 nmi²) to obtain mysticete and odontocete densities and the estimated area was 1,419 km² (413.7 nmi²) to obtain pinniped densities.

Of the six species of pinnipeds that may be present in the study area during the planned action, only four species are expected to be observed and occur mostly near pack ice or coastal areas and are not prevalent in open sea areas where the low-energy seismic survey will be conducted. Because density estimates for pinnipeds in that Antarctic region typically represent individuals that have hauled-out of the water, those estimates are not representative of individuals that are in the water and could be potentially exposed to underwater sounds during the seismic airgun operations and icebreaking activities; therefore, the pinniped densities have been adjusted to account for this concern. Take was not requested for southern elephant seals and Antarctic fur seals because preferred habitat for these species is not within the planned action area. Although no sightings of Weddell seals and spectacled porpoises were reported in the BROKE-West sighting data, take was requested for these species based on NMFS recommendation and IWC SOWER data. Although there is some uncertainty about the representativeness of the data and the assumptions used in the calculations below, the approach used here is believed to be the best available approach.

Table 5. Estimated densities and possible number of marine mammal species that might be exposed to greater than or equal to 120 dB (icebreaking) and 160 dB (airgun operations) during NSF and ASC's planned low-energy seismic survey (approximately 1,000 km of tracklines/approximately 21,540 km² ensonified area for icebreaking activities and approximately 2,800 km of tracklines/approximately 5,628 km² ensonified area for airgun operations) in the Dumont d'Urville Sea of the Southern Ocean, January to March 2014.

Species	Reported Sightings ^{1,2} *Sightings have been pro-rated to include unidentified animals*	Corrected Sightings (Assume 20% for Cetaceans)	Density (#/km ²)	Calculated Take from Seismic Airgun Operations (i.e., Estimated Number of Individuals Exposed to Sound Levels \geq 160 dB re 1 μ Pa) ³	Calculated Take from Icebreaking Activities (i.e., Estimated Number of Individuals Exposed to Sound Levels \geq 120 dB re 1 μ Pa) ⁴	Approximate Percentage of Population Estimate (Calculated Total Take) ⁵	Total Take Authorized ⁶
Mysticetes							
Southern right whale	0	0	0	0	0	0	0
Humpback whale	238	1,190	0.1029768	580	2,218	8.0	580 + 2,218 = 2,798
Antarctic minke whale	136	680	0.0588439	331	1,267	0.53	331 + 1,267 = 1,598
Sei whale	4	20	0.0017307	10	37	0.06	10 + 37 = 47
Fin whale	232	1,160	0.1003808	565	2,162	1.9	565 + 2,162 = 2,727
Blue whale	2	10	0.0008654	5	19	1.4	5 + 19 = 24
Odontocetes							
Sperm whale	32	160	0.0138456	78	298	3.9	78 + 298 = 376
Arnoux's beaked whale	0	0	0	0	0	NA	0
Cuvier's beaked whale	0	0	0	0	0	NA	0
Southern bottlenose whale	0	0	0	0	0	NA	0
Killer whale	62	310	0.0268259	151	578	2.9	151 + 578 = 729
Long-	24	120	0.0103842	58	224	0.1	58 + 224 =

finned pilot whale							282
Hourglass dolphin	26	130	0.0112496	63	242	0.2	$63 + 242 = 305$
Spectacled porpoise	33	165	0.0142783	80	308	NA	$80 + 308 = 388$
Pinnipeds							
Crabeater seal	NA	NA	0.868000	4,885	18,697	0.5	$4,885 + 18,697 = 23,582$
Leopard seal	17	24	0.051486	290	1,109	0.6	$290 + 1,109 = 1,399$
Ross seal	42	59	0.127201	716	2,740	2.7	$716 + 2,740 = 3,456$
Weddell seal	NA	NA	0.0756	425	1,628	0.4	$425 + 1,628 = 2,053$
Southern elephant seal	0	0	0	0	0	NA	0
Antarctic fur seal	0	0	0	0	0	NA	0

NA = Not available or not assessed.

¹ Sightings from a 52 day (5,753 km²) period on the AAD BROKE-West survey during January to March 2006.

² Sightings December 3 to 16, 1999 (1,420 km² and 75,564 km²) below 60° South latitude between 110 to 165° East longitude. All sightings were animals hauled-out of the water and on the sea ice.

³ Calculated take is estimated density (reported density times correction factor) multiplied by the area ensonified to 160 dB (rms) around the planned seismic lines, increased by 25% for contingency.

⁴ Calculated take is estimated density (reported density) multiplied by the area ensonified to 120 dB (rms) around the planned transit lines where icebreaking activities may occur.

⁵ Total requested (and calculated) takes expressed as percentages of the species or regional populations.

⁶ Requested Take Authorization includes unidentified animals that were added to the observed and identified species on a pro-rated basis.

Note: Take was not requested for southern elephant seals and Antarctic fur seals because preferred habitat for these species is not within the action area.

Icebreaking in Antarctic waters will occur, as necessary, between the latitudes of approximately 66 to 70° South and between 140 and 165° East, and between approximately 65 to 66° South and between 95 to 135° East. Based on a maximum sea ice extent of 250 km and estimating that the Palmer will transit to the innermost shelf and back into open water twice – a round trip transit in each of the potential work regions, it is estimated that the Palmer will actively break ice up to a distance of 1,000 km. Based on the ship's speed of 5 kts under moderate ice conditions, this distance represents approximately 108 hrs of icebreaking operations. This calculation is likely an overestimation because icebreakers often follow leads when they are available and thus do not break ice at all times.

Numbers of marine mammals that might be present and potentially disturbed are estimated based on the available data about marine mammal distribution and densities in the Southern Ocean study area during the austral summer. NSF and ASC estimated the number of different individuals that may be exposed to airgun sounds with received levels greater than or equal to 160 dB re 1 μ Pa (rms) for seismic airgun operations and greater than or equal to 120 dB re 1 μ Pa (rms) for icebreaking activities on one or more occasions by considering the total marine area that will be within the 160 dB radius around the operating airgun array and 120 dB radius for the icebreaking activities on at least one occasion and the expected density of marine mammals in the area (in the absence of the seismic survey and icebreaking activities). The number of possible exposures can be estimated by considering the total marine area that will be within the 160 dB radius (i.e., diameter is 1,005 m times 2) around the operating airguns. The ensonified area for icebreaking was estimated by multiplying the distance of the icebreaking activities (1,000 km) by the estimated diameter of the area within the 120 dB radius (i.e., diameter is 21,544 m). The 160 dB radii are based on acoustic modeling data for the airguns that

may be used during the action (see Attachment B of the IHA application). As summarized in Table 2 (see Table 11 of the IHA application), the modeling results for the planned low-energy seismic airgun array indicate the received levels are dependent on water depth. Since the majority of the planned airgun operations will be conducted in waters 100 to 1,000 m deep, the buffer zone of 1,005 m used for the two 105 in³ GI airguns was used to be more conservative. The expected sighting data for pinnipeds accounts for both pinnipeds that may be in the water and those hauled-out on ice surfaces. While the number of cetaceans that may be encountered within the ice margin habitat will be expected to be less than open water, the estimates utilized expected sightings for the open water and represent conservative estimates. It is unlikely that a particular animal will stay in the area during the entire survey.

The number of different individuals potentially exposed to received levels greater than or equal to 160 dB re 1 μ Pa (rms) from seismic airgun operations and 120 dB re 1 μ Pa (rms) for icebreaking activities was calculated by multiplying:

- (1) The expected species density (in number/km²), and
- (2) The anticipated area to be ensonified to that level during airgun operations.

Applying the approach described above, approximately 5,628 km² (including the 25% contingency) will be ensonified within the 160 dB isopleth for seismic airgun operations and approximately 21,540 km² will be ensonified within the 120 dB isopleth for icebreaking activities on one or more occasions during the survey. The take calculations within the study sites do not explicitly add animals to account for the fact that new animals (i.e., turnover) are not accounted for in the initial density snapshot and animals could also approach and enter the area ensonified above 160 dB for seismic airgun operations and 120 dB for icebreaking activities; however, studies suggest that many marine mammals will avoid exposing themselves to sounds

at this level, which suggests that there will not necessarily be a large number of new animals entering the area once the seismic survey and icebreaking activities started. Because this approach for calculating take estimates does not allow for turnover in the marine mammal populations in the area during the course of the survey, the actual number of individuals exposed may be underestimated, although the conservative (i.e., probably overestimated) line-kilometer distances used to calculate the area may offset this. Also, the approach assumes that no cetaceans or pinnipeds will move away or toward the tracklines as the Palmer approaches in response to increasing sound levels before the levels reach 160 dB for seismic airgun operations and 120 dB for icebreaking activities. Another way of interpreting the estimates that follow is that they represent the number of individuals that are expected (in absence of a seismic airgun and icebreaking program) to occur in the waters that will be exposed to greater than or equal to 160 dB (rms) for seismic airgun operations and greater than or equal to 120 dB (rms) for icebreaking activities.

NSF and ASC's estimates of exposures to various sound levels assume that the planned surveys will be carried out in full; however, the ensonified areas calculated using the planned number of line-kilometers has been increased by 25% to accommodate lines that may need to be repeated, equipment testing, etc. As is typical during offshore ship surveys, inclement weather and equipment malfunctions are likely to cause delays and may limit the number of useful line-kilometers of seismic operations that can be undertaken. The estimates of the numbers of marine mammals potentially exposed to 120 dB (rms) and 160 dB (rms) received levels are precautionary and probably overestimate the actual numbers of marine mammals that could be involved. These estimates assume that there will be no weather, equipment, or mitigation delays, which is highly unlikely.

Table 5 shows the estimates of the number of different individual marine mammals anticipated to be exposed to greater than or equal to 120 dB re 1 μ Pa (rms) for icebreaking activities and greater than or equal to 160 dB re 1 μ Pa (rms) for seismic airgun operations during the seismic survey if no animals moved away from the survey vessel. The total take authorized is given in the far right column of Table 5.

Encouraging and Coordinating Research

NSF and ASC will coordinate the planned marine mammal monitoring program associated with the low-energy seismic survey with other parties that express interest in this activity and area. NSF and ASC will coordinate with applicable U.S. agencies (e.g., NMFS), and will comply with their requirements. NSF has already reached out to the Australian Antarctic Division (AAD), who are the proponents of the proposed marine protected area and regularly conduct research expeditions in the marine environment off East Antarctica.

The planned action will complement fieldwork studying other Antarctic ice shelves, oceanographic studies, and ongoing development of ice sheet and other ocean models. It would facilitate learning at sea and ashore by students, help to fill important spatial and temporal gaps in a lightly sampled region of coastal Antarctica, provide additional data on marine mammals present in the East Antarctic study areas, and communicate its findings via reports, publications and public outreach.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

Section 101(a)(5)(D) of the MMPA also requires NMFS to determine that the authorization will not have an unmitigable adverse effect on the availability of marine mammal species or stocks for subsistence use. There are no relevant subsistence uses of marine mammals in the study area (in the Dumont d'Urville Sea off the coast of East Antarctica) that implicate

MMPA section 101(a)(5)(D).

Analysis and Determinations

Negligible Impact

NMFS has defined “negligible impact” in 50 CFR 216.103 as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.”

In making a negligible impact determination, NMFS evaluated factors such as:

- (1) The number of anticipated injuries, serious injuries, or mortalities;
- (2) The number, nature, and intensity, and duration of Level B harassment (all relatively limited); and
- (3) The context in which the takes occur (i.e., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);
- (4) The status of stock or species of marine mammals (i.e., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- (5) Impacts on habitat affecting rates of recruitment/survival; and
- (6) The effectiveness of monitoring and mitigation measures.

For reasons stated previously in this document, in the notice of the proposed IHA (79 FR 464, January 3, 2014) and based on the following factors, the specified activities associated with the marine seismic survey are not likely to cause PTS, or other non-auditory injury, serious injury, or death. The factors include:

- (1) The likelihood that, given sufficient notice through relatively slow ship speed, marine mammals are expected to move away from a noise source that is annoying prior to its becoming

potentially injurious; and

(2) The potential for temporary or permanent hearing impairment is relatively low and will likely be avoided through the implementation of the shut-down measures.

No injuries, serious injuries, or mortalities are anticipated to occur as a result of the NSF and ASC's planned low-energy marine seismic survey, and none are authorized by NMFS.

Table 5 of this document outlines the number of requested Level B harassment takes that are anticipated as a result of these activities. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section above) in this notice, the activity is not expected to impact rates of annual recruitment or survival for any affected species or stock, particularly given the requirement to implement mitigation, monitoring, and reporting measures to minimize impacts to marine mammals.

Additionally, the seismic survey will not adversely impact marine mammal habitat.

For the marine mammal species that may occur within the action area, there are no known designated or important feeding and/or reproductive areas. Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (i.e., 24 hr cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). Additionally, the seismic survey will be increasing sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals), which is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

Of the 14 marine mammal species under NMFS jurisdiction that may or are known to likely to occur in the study area, five are listed as threatened or endangered under the ESA:

southern right, humpback, sei, fin, blue, and sperm whales. These species are also considered depleted under the MMPA. Of these ESA-listed species, incidental take has been requested to be authorized for humpback, sei, fin, blue, and sperm whales. There is generally insufficient data to determine population trends for the other depleted species in the study area. To protect these animals (and other marine mammals in the study area), NSF and ASC must cease or reduce airgun operations if any marine mammal enters designated zones. No injury, serious injury, or mortality is expected to occur and due to the nature, degree, and context of the Level B harassment anticipated, and the activity is not expected to impact rates of recruitment or survival.

As mentioned previously, NMFS estimates that 14 species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the IHA. The population estimates for the marine mammal species that may be taken by Level B harassment were provided in Table 4 of this document.

NMFS's practice has been to apply the 160 dB re 1 μ Pa (rms) received level threshold for underwater impulse sound levels and the 120 dB re 1 μ Pa (rms) received level threshold for icebreaking activities to determine whether take by Level B harassment occurs. Southall et al. (2007) provide a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall et al. [2007]).

NMFS has determined, provided that the aforementioned mitigation and monitoring measures are implemented, the impact of conducting a low-energy marine seismic survey in the Dumont d'Urville Sea off the coast of East Antarctica, January to March 2014, may result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of certain species of marine mammals.

While behavioral modifications, including temporarily vacating the area during the operation of the airgun(s), may be made by these species to avoid the resultant acoustic disturbance, the availability of alternate areas within these areas for species and the short and sporadic duration of the research activities, have led NMFS to determine that the taking by Level B harassment from the specified activity will have a negligible impact on the affected species in the specified geographic region. NMFS believes that the length of the seismic survey, the requirement to implement mitigation measures (e.g., shut-down of seismic operations), and the inclusion of the monitoring and reporting measures, will reduce the amount and severity of the potential impacts from the activity to the degree that it will have a negligible impact on the species or stocks in the action area.

Small Numbers

The estimate of the number of individual cetaceans and pinnipeds that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re 1 μ Pa (rms) and sounds from icebreaking activities with received levels greater than or equal to 120 dB re 1 μ Pa (rms) during the survey is (with 25% contingency) in Table 5 of this document. That total (with 25% contingency) includes 2,798 humpback, 1,598 Antarctic minke, 47 sei, 2,727 fin, 24 blue, and 376 sperm whales could be taken by Level B harassment during the seismic survey, which will represent 8, 0.53, 0.06, 1.9, 1.4, and 3.9 % of the worldwide or regional populations, respectively. Some of the cetaceans potentially taken by Level B harassment are delphinids and porpoises: killer whales, long-finned pilot whales, hourglass dolphins, and spectacled porpoises are estimated to be the most common delphinid and porpoise species in the area, with estimates of 729, 282, 305, and 308, which will represent 2.9, 0.1, and 0.2 % (spectacled porpoise population is not available) of the affected worldwide or regional populations, respectively.

Most of the pinnipeds potentially taken by Level B harassment are: crabeater, leopard, Ross, and Weddell seals with estimates of 23,582, 1,399, 3,456, and 2,053, which will represent 0.5, 0.6, 2.7, and 0.4% of the affected worldwide or regional populations, respectively.

NMFS has determined, provided that the aforementioned mitigation and monitoring measures are implemented, that the impact of conducting a low-energy marine seismic survey in the Dumont d'Urville Sea off the coast of East Antarctica, January to March 2014, may result, at worst, in a temporary modification in behavior and/or low-level physiological effects (Level B harassment) of small numbers of certain species of marine mammals. The requested take estimates represent small numbers relative to the affected species or stock sizes (i.e., all are less than or equal to 8%). See Table 5 for the requested authorized take numbers of marine mammals.

Endangered Species Act

Of the species of marine mammals that may occur in the survey area, several are listed as endangered under the ESA, including the humpback, sei, fin, blue, and sperm whales. NSF and ASC did not request take of endangered Southern right whales due to the low likelihood of encountering this species during the cruise. Under section 7 of the ESA, NSF, on behalf of ASC and five other research institutions, initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this low-energy seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, also initiated formal consultation under section 7 of the ESA with the Endangered Species Act Interagency Cooperation Division, to obtain a Biological Opinion evaluating the effects of issuing the IHA under section 101(a)(5)(D) of the MMPA on threatened and endangered marine mammals. These two consultations were consolidated and addressed in a

single Biological Opinion addressing the effects of these actions. NMFS's Biological Opinion concluded that the action and issuance of the IHA are not likely to jeopardize the continued existence of listed species and included an Incidental Take Statement incorporating the requirements of the IHA as Terms and Conditions. The Biological Opinion also concluded that designated critical habitat of these species does not occur in the action area.

National Environmental Policy Act

NSF and ASC provided NMFS a "Initial Environmental Evaluation/Environmental Assessment to Conduct Marine-Based Studies of the Totten Glacier System and Marine Record of Cryosphere – Ocean Dynamics," (IEE/EA) prepared by AECOM on behalf of NSF and ASC. The IEE/EA analyzes the direct, indirect, and cumulative environmental impacts of the planned specified activities on marine mammals including those listed as threatened or endangered under the ESA. NMFS, after review and evaluation of the NSF and ASC IEE/EA for consistency with the regulations published by the Council of Environmental Quality (CEQ) and NOAA Administrative Order 126-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, prepared an independent Environmental Assessment (EA) titled "Environmental Assessment on the Issuance of an Incidental Harassment Authorization to the National Science Foundation and Antarctic Support Contract to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Dumont d'Urville Sea off the Coast of East Antarctica, January to March 2014." NMFS has determined that the issuance of the IHA is not likely to result in significant impacts on the human environment and issued a Finding of No Significant Impact (FONSI).

Authorization

NMFS has issued an IHA to NSF and ASC for the take, by Level B harassment, of small

numbers of marine mammals incidental to conducting a low-energy marine seismic survey in the Dumont d'Urville Sea off the coast of East Antarctica, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: March 4, 2014.

Donna S. Wieting,
Director,
Office of Protected Resources,
National Marine Fisheries Service.

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